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A shake of the head is the start
of success

2

Controlling expenses while
expressing the message

5

What came first, the leader or
the statement?

8

Cray Research delivers horsepower
to the auto industry

10

Power made easy

14

INTERACT strengthens
communication commitment

16

While the India Team members experienced the triumph of selling the first Cray Research system to India, their rewards were personal as well. Clockwise above, Mike East, sales account manager, U.K., his wife Ruth East, Colin Campbell, software support manager, U.K., and his wife Rita Campbell, take an elephant ride from the Maharajah's palace to a hilltop in Jaipur.

A shake of the head is the start of success



He was describing the possibility of installing a Cray Research supercomputer to a group of government officials from another country. The subject was new to this audience, and the

presentation was being delivered in what was, to many of them, a second language. Explanations were difficult.

As he moved closer to the heart of his presentation, hitting key points and emphasizing appropriate material, he was nervous. His eyes scanned the listeners' faces, searching for expressions of understanding that would encourage him to continue — a simple nod of the head, a raised eyebrow, an attentive glance. Instead, he saw heads moving in figure-eight motions. What did this mean?

It meant success! Geoff Brewer, a member of the Cray Research team that worked to sell the first Cray Research system to India, had succeeded. He had helped Indian officials understand more about Cray Research supercomputers and the feasibility of an installation in India. The figure-eight motion meant "we understand."

Geoff's presentation marked one of a number of obstacles overcome by the Cray Research employees who set out to pioneer a new territory for the company. The six individuals called the "India Team" overcame communication and cultural differences, variances in business practices, travel difficulties, controls from government organizations, and pressures from American and Japanese competitors.

The reward? Two sales to the Indian government and the opening of the Cray India sales office.

Responding to a need

India needed a supercomputer; the purchase of a Cray Research system could mean the difference between life and death. Each year, India is bombarded by at least one monsoon that kills many people and destroys crops worth millions of dollars. Those people fortunate enough to survive the storm itself face the prospect of starvation due to lost crops. Using a supercomputer for mid-range weather forecasting, Indian researchers could forecast when the monsoon would hit, as well as its intensity, location, and direction. This information could allow proactive storm preparation and warnings days in advance of the storm's arrival. In addition, the supercomputer could help researchers determine the best time to plant and harvest crops.

No Indian companies manufacture supercomputers, so the country had to look outside its borders. Knowing Cray Research is the leader in the industry, Indian government officials approached the U.S. government to discuss buying a system. The U.S. government, however, was wary of selling a supercomputer to India because of technology transfer and security issues.



Each year, a life-threatening monsoon strikes India. The country's purchase of a Cray Research supercomputer will help Indian researchers predict the storm's arrival, allowing for proactive preparation.

In 1986, a member of India's academic community contacted Cray Research's office in the United Kingdom (U.K.). Professor V. Rajaraman, who conducts computer-related research and teaches computer studies at the India Institute of Science at Bangalore, received clearance from his government to investigate the possibility of purchasing a supercomputer. Rajaraman was familiar with Cray Research's products, through both his high position in the Indian academic arena and his contact with Ram Gupta, his former engineering student and now a chief design engineer for Cray Research, Chippewa Falls.

Drafting team players

India's interest in Cray Research was reciprocated. The eighth largest country in the world by gross national product (GNP), India is a developing

country and a viable prospect for Cray Research. Because of the United Kingdom's historical ties with the Indian culture and language, it was appropriate that a member of the U.K. group act as manager of the team. Mike East, sales account manager, assumed this role. The five additional core members of the India Team, also from the U.K. group, were: Geoff Brewer, engineering services; Colin Campbell, software support manager; Gary McClellan, analyst-in-charge; Andy Price, project manager; and Andy Walker, district engineering manager.

Several additional players were called on for their expertise. Suzy Tichenor, director of international trade affairs, Washington, D.C., coordinated many meetings and conducted presentations with U.S. government officials. Mike Dickey, vice president of international marketing, Minneapolis, made the

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original sales call on the Indian government in Delhi. After that, he made several more trips to India, acting as liaison among the India Team, employees at corporate headquarters, and other involved U.S. offices. Other members of the corporate marketing group, as well as the legal, accounting, and finance departments, assisted with the sale.

Why the large-scale effort to sell a system to India? "At the time, both Control Data Corporation (CDC) and the Japanese were eagerly working to penetrate this untouched market," says Mike East. "There was no way Cray Research, with its superior product, was going to give them free entry into this new territory." Mike estimates that Cray Research has the potential to sell from five to 10 systems to India by 1995. Potential systems could be used for meteorology, oil exploration, and general science applications.

Setting up the plays

In all of its many huddles, the team's plays were simple — be candid with the Indian and the U.S. government, send consistent messages, understand and consider Indian cultural differences, and be patient!

Within 36 months, Mike made 32 trips to India from the United Kingdom. In India, meetings were held with government officials to educate them on the uses of supercomputers and the high-power capabilities of Cray Research's products compared to systems offered by the competition. In London, similar meetings were held with such influential groups as the Indian High Commission, Commonwealth Secretariats, Common Trade Delegates, and the British and South Asian Trade Association.

"One person could not have done all the traveling required to make this effort successful," says Mike. "The team effort and the team attitude made everything work."

The miles logged by the India Team were not without hurdles. Meetings were held at a number of

different locations within the 3.5 million-square-mile country. Airplane departure times are unreliable, and automobile travel is time-consuming. Cars battle with both people and animals on roadways, and scheduled meeting times are less rigid than they might be in the United States or United Kingdom.

The 11-hour time difference between the United States and India, and the five-hour difference between the United Kingdom and India complicated communication. The team established a system whereby it communicated with the Indian group in the morning, U.K. employees in the afternoon, and co-workers in the United States in the late evening.

The largest obstacle, however, was assuring the U.S. government that India would maintain the security of the system, using it only for authorized projects. Team members traveled extensively to Washington, D.C., Bombay, Delhi, and London. In Washington, team members met with American government groups such as the Department of Commerce, the State Department, the Department of Defense, and the National Security Council. By emphasizing India's need for a supercomputer and the weather forecasting power of a Cray Research machine, the team convinced officials that India was a suitable customer for Cray Research.

In addition, a security plan was developed to protect Cray Research's technology. After many discussions between Cray Research and the two governments, the plan held the assurance the U.S. government needed to grant an export license for the sale. The government issued the license in 1987, and the machine was delivered to The National Centre for Medium Range Weather Forecasting. A second system awaits delivery to the India Institute of Science at Bangalore, pending export license approval.

Cray India

The team's final challenge was to set up a Cray Research office in India, a country where strict laws prohibit foreign organizations from

opening offices and trading goods unless the company is 60 percent Indian-owned.

Without an official office, Cray Research employees technically were not considered employees in India. As a result, they were required to leave the country every 90 days. Each employee's visa, however, granted only three entries to the country; after these three uses, a new visa was required. Initially, the lack of an official office also prohibited Cray Research from opening a corporate bank account in India. This law was waived in recognition of the valuable incoming product, but not before Mike East felt its impact.

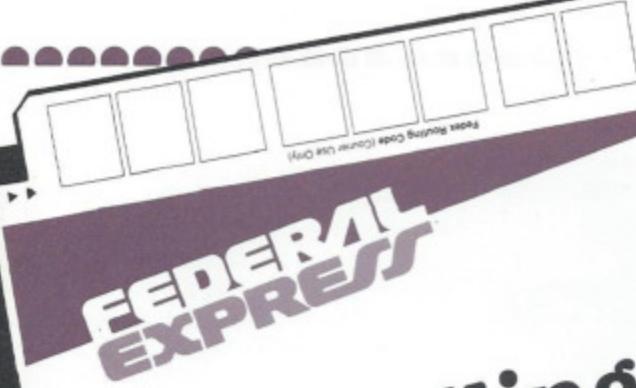
"Until the law was waived and the office legally set up, I ran Cray India out of my personal Indian bank account," says Mike. "By the time our office was official, my account was overdrawn by \$10,000."

The new office allows Cray Research employees to conduct basic business — paying expenses, accepting fees, and maintaining the Cray Research system in India. Cray Research now can focus on other supercomputer prospects in India.

A victorious experience

As members of the India Team watch the not-so-instant replay of their efforts, they are satisfied and proud. Cray Research opened a new territory and sold the first supercomputer to India. Cray Research opened an office and now can educate and nurture new prospects. Cray Research stayed in the game, overcoming challenges as they were encountered.

The rewards are personal as well. "Not only did I make achievements in my work, I experienced an entirely different culture — that's very fulfilling," says Mike East. And Geoff Brewer saw his presentation pay off. "Watching a supercomputer being installed in a country so in need is incredibly satisfying." ■



Controlling expenses while expressing the message

FEDEX LETTER

Each quarter, Cray Research spends approximately \$375,000 on domestic express mail services and \$30,000* on copy paper. Communication by "hard copy" has become a high-cost effort and an important issue to tackle for many companies.

Without even realizing it, Cray Research employees can have a striking impact on reducing excess company spending in this area. Consider the routine tasks you do in a day. For example, did you really need to photocopy and distribute 50 reports yesterday afternoon, or could you have gotten away with a couple of copies, circulated among the individuals on your distribution list? Did that Federal Express package you sent out this morning absolutely, positively have to be there overnight?

Concerned employees

Many employees at Cray Research have expressed their concern about wasted office paper. Some individuals are disturbed by the environmental impact and others are troubled by the high costs to the company. The U.S.

Environmental Protection Agency estimates that, by weight, 90 percent of the material discarded by an office is paper. In many locations, Cray Research employees have begun paper recycling programs. Recycling reduces the amount of paper that ends up in landfills or other disposal systems, such as incinerators and composting facilities.

While paper recycling is important, curbing office paper waste can be more significant. The following are tips to help employees do their part to pare down office paper waste and company costs:

- Use electronic mail to send messages, rather than producing and distributing "hard copy."
- Copy letters, memos, and reports on both sides of a piece of paper. Most Cray Research facilities have copiers with double-side copying capabilities.
- Limit use of double-spacing and large print in letters and memos, to get more use out of a piece of paper.
- Use a bulleted format to display the meat of the information in a letter or report, rather than a long narration.

- Before writing a memo or report, consider other methods for communicating the message. Is there an upcoming meeting in which you can verbally convey the information?
- Cut up obsolete and non-proprietary reports, forms, and memos that have only been printed on one side. Use the blank sides as scratch paper.
- If your copy job is quite large and you are not under an extreme time constraint, send the job to the copy center located in the distribution center, Mendota Heights. Using the convenience copiers found at most Cray Research locations costs twice as much as using the copy center. Contact Zoe Merrell in Mendota Heights for more information about services provided, time considerations, and the size of jobs that are economical to send to the center.
- Make certain your document is free of spelling errors and other mistakes before copying it. This reduces the need to recopy.
- Consider using a lower grade of paper for routine writing tasks. High-grade, watermarked bond paper and Cray Research letterhead should not be used for sketching out ideas or dashing off a note to a co-worker.

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*This cost does not include the amount spent on copy paper in our regions or international subsidiaries.



Always looking for opportunities to curb excessive mail costs, Glen Bakken, office facilities clerk in the Minneapolis mailroom, uses bulk mailing techniques whenever and wherever possible.

- Use centralized bulletin boards, such as the ones found in most lunchrooms, for memos directed to all employees in an office, rather than creating copies for individual distribution.
- Circulate, don't duplicate! Limit the number of copies of each report or memo you generate. If you are sending many copies of your piece to one department, send only one copy and have the department circulate the copy among its members.

Saving on express mail costs

Clearly, the need to share information and materials goes beyond departmental or building boundaries. In a worldwide company, communications must cross city, state, and country borders. The most common

aid in this distribution process is express mail.

Dan Leis is traffic supervisor for Chippewa Falls operations. He coordinates the majority of express mail shipments sent out from the manufacturing facility. These shipments range in size from a standard letter to a 10-pound package. Dan says the express mail service used for each package is a decision made by each employee sender, and that Federal Express service is the most popular among employees because it has become a generic term for express mail service.

"People say 'Fed Ex it' without realizing that other, less expensive shipping companies, such as Airborne Express or United Parcel Service (UPS), are often appropriate for certain package deliveries and provide excellent service," says Dan.

Dan suggests taking a good look at the service you specify to determine if it's the most economical for your needs. The chart accompanying this article shows the cost and timing issues of several express mail services.

Cray Research received bids from many express mail companies in 1989. Airborne presented the most competitive price and service, and Cray Research set up a company-wide discount with Airborne. The cost of the Airborne services listed in the chart reflects this discount; all other services do not. It's important to find out which of the services are offered at each Cray Research location.

Gary Schroeder, manager of software distribution, Mendota Heights, has conducted studies to determine the most cost-effective service for certain packages. He finds that in terms of price and service, the best choices are: Airborne for overnight domestic and international shipments of any size, and UPS services for packages that do not require next-day delivery.

Dennis Abraham, coordinator at the distribution center, arranges the shipment of 50 to 60 Airborne packages each day. The distribution center staff strongly supports the use of Airborne as the only overnight service provided by the center because of its excellent service and company-wide corporate discount. The distribution center will provide other services at the request of the sender, if the service is charged to another account.

Bulk mailing

Numerous letters and packages headed for the same destination provide a great opportunity to reduce mail costs — they can be combined in one package! Many mailroom staffs throughout the company currently use this technique. Larry Torbenson, office facilities clerk, Minneapolis, keeps express mail envelopes open until the end of the day to determine if any express mail is going to the same address. He then groups the letters together in one express package.

Lucille Zenner is lead person for the Chippewa Falls mailroom, where she sends packages out through the

Express Mail Services

| Next-Day Services | Price for Domestic Service | | Arrives at Domestic Destination | Price for International Service | Arrives at International Destination | |
|---|--|--|--|--|---|--|
| Federal Express Priority 1 Service | Letter up to 8 oz. 1 lb. pack 2 lb. pack 5 lb. pack | | \$15.00 \$20.25 \$23.00 \$31.25 | Next business day. Time varies according to zip code destination, but most major cities by 10:30 a.m. | Varies according to weight and destination. | Varies according to destination. Ex: Mpls. to Tokyo, Japan — at least three business days. |
| DHL Worldwide Express Mail Service | Letter up to 5 oz. 1-2 lb. pack 3 lb. pack 5 lb. pack | | \$14.00 \$25.00 \$28.00 \$34.00 | Next business day. Time varies according to weight and zip code destination. Most major cities: within city limits, 12:00 p.m.; outside limits, 5:00 p.m. | Varies according to weight and destination. | Varies according to destination. At least three business days for both no-value goods and dutiable goods. |
| Federal Express Standard Service | Letter up to 8 oz. 1 lb. pack 2 lb. pack 5 lb. pack | | \$11.25 \$12.50 \$13.50 \$16.50 | Next business day, after 12:00 p.m. | Offered only for shipments to Puerto Rico. | Not applicable. |
| United Parcel Service (UPS) Next-day Service | Letter up to 8 oz. 1 lb. pack 2 lb. pack 5 lb. pack | | \$ 8.50 \$12.00 \$13.00 \$16.50 | Next business day. Time varies according to zip code destination, but most major cities by 12:00 p.m. | Varies according to weight and destination. | Varies according to destination. Ex: Mpls. to Tokyo, Japan — at least two business days for no value goods. |
| U.S. Mail Express Service/ Express Mail International Service | Letter up to 8 oz. 1-2 lb. pack 3 lb. pack 5 lb. pack | | \$ 8.35 \$ 9.70 \$12.40 \$12.40 | Next business day. Time varies according to zip code destination, but most major cities by 12:00 p.m. | Express Mail International — up to 8 oz. to any country, \$10.75. 8 oz. or larger varies according to weight and destination. | Varies according to destination. Ex: Mpls. to Tokyo, Japan — three to four business days. |
| Airborne Express Standard Service | Letter up to 8 oz. 1-2 lb. pack 3 lb. pack 5 lb. pack | | \$ 7.00 \$ 8.00 \$ 9.00 \$11.00 | Next business day. Time varies according to zip code destination, but most major cities by 12:00 p.m. | Varies according to weight and destination. | Varies according to destination. Ex: Mpls. to Tokyo, Japan, at least three business days for no value goods. Add two days for dutiable goods. |
| Two-Day Services | Price for Domestic Service | | Arrives at Domestic Destination | Price for International Service | Arrives at International Destination | |
| Federal Express Economy Service | 1 lb. 2 lb. pack 5 lb. pack | | \$12.50 \$13.50 \$16.50 | Second business day, no later than 4:30 p.m. | Not offered. | Not applicable. |
| Airborne Express Second-day Service | Letter 1-3 lb. pack 5 lb. pack | | \$ 6.00 \$ 6.00 \$ 6.50 | Second business day. By noon or 5:00 p.m., depending on zip code destination. | Not offered. | Not applicable. |
| UPS Second-day Service | 1 lb. pack 2 lb. pack 5 lb. pack | | \$ 3.00 \$ 4.00 \$ 6.50 | Any time second business day. | Not offered. | Not applicable. |

U.S. mail system. Lucille and her co-workers consolidate pieces of mail for distribution to sites and vendors that often receive several pieces of mail from Chippewa Falls each day.

Lucille has come up with some guidelines of her own for combining pieces of mail going to the same address. She figures the number of pieces, the cost of the larger envelope, and the labor involved. She will only bulk mail three pieces or more. And

she suggests that employees sending mail within Cray Research, but outside of their immediate office, use a reusable interoffice envelope, rather than a more expensive, large first-class or number 10 size envelope. If the piece is confidential, stickers can be placed over the ties on the back of the envelope to ensure the piece is not read by anyone except the individual for whom it is meant.

These are just a few ideas for reducing office waste and company

costs. There are other areas in which all employees can help Cray Research make better use of its resources. Cray Research is filled with innovative, imaginative thinkers who have helped solve some of the world's most complex problems. These same employees probably have equally creative ideas about recycling and saving money in other areas of company operations. Please share your ideas with your co-workers. ●

What came first, the leader or the statement?

A statement does not make a leader, but can a leader make a statement? At Cray Research, the answer is yes! In fact, a number of employees inspired the creation of the "Leaders at Cray Research" statement.

Created by a subgroup of the Risk and Creativity Task Team, the leadership statement says: "Leaders at Cray are individuals who by their vision and example lead projects and people to shared success."

This statement is a declaration of what already exists at Cray Research — a testimony to the ways in which many employees work. In crafting the statement, the subgroup looked at the attributes of employees who are thought of as model leaders within the organization. Like the 36 employees who in 1989 were recognized and awarded for their leadership and innovation, through a new program called the "Cray Research Awards for Leadership and Innovation."

Employees like Delores Brun, wiring assembly lead person in manufacturing, Chippewa Falls, awarded for her enthusiasm for her work and co-workers; John Mertz, senior programmer analyst in marketing, Mendota Heights, honored for his work in optimizing important codes on Cray Research's systems, which advanced the company's presence

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in the pharmaceutical industry; and Terry Jacobson, quality engineer in manufacturing, Chippewa Falls, recognized for developing an Electro-Static Discharge (ESD) education program for the company. ESD is very harmful to the company's static-sensitive products, and Terry

has invented many devices to reduce ESD of employees working directly with Cray Research's products.

The contributions of these and other leaders are felt company-wide. These individuals — and there are many, many more — are known to numerous employees for their visionary thinking, novel ways of working, bright ideas, and distinct leadership abilities. Leaders and risk takers are vital to Cray Research; they possess qualities that are essential in continuing the company's leadership position in the supercomputing industry.

While the recognized leaders of 1989 are important to the company, the leadership statement itself is equally significant, as it will help foster leadership and identify many additional leaders at Cray Research.

"The statement secures a common understanding of what leadership means at Cray Research, which allows us all to recognize and promote leadership," says Marcelo Gurnucio, president and chief operating officer. "This statement should inspire employees to decide how to challenge themselves, their bosses, and their colleagues to believe in and work by this philosophy.

"Cray Research is a leading-edge company whose success clearly depends on our continued leadership and innovation within the supercomputing industry," Marcelo continues.

"The company cannot achieve this success without employees who strive to be leaders in their areas of work. Employees must think of and share bright ideas, take risks, and do the best job they can to help the company achieve its objectives."

A vision

The "Leaders at Cray Research" statement is unique to the company because of four key elements: vision, example, projects and people, and shared success.

Leaders at Cray Research formulate their own ideas about the future — their personal future, their professional future, and the future of the company. Leaders don't look to their bosses, teammates, or co-workers for this vision. They develop their own thoughts on how to challenge themselves and improve their work. Terry Jacobson saw that the company needed an ESD program; he formed an ESD committee, and he took charge. He determined how his job as quality engineer fit with the goals of the company and then acted on his thoughts and ideas, implementing what he believed was best for Cray Research.

A good example

Being a Cray Research leader means acting like a leader. Everybody benefits from the excellent examples of others. Many of us know co-workers who are dedicated to their work, who fully understand how their roles and responsibilities fit with company objectives, and who work to be experts at their jobs. John Mertz is such a leader. His work on optimizing chemistry codes is recognized throughout the company, as well as among his peers in the chemical industry. Leaders like John provide excellent examples for all employees to emulate.

Not just leading people

Leadership often is confused with management, but while not everyone is a manager, everyone certainly can be a leader. A leader at Cray Research can lead people, projects, or both. He or she can stay at the cutting edge of his or her work and keep abreast of current industry issues and technology as they relate to his or her function. These people aggressively continue

they can be, advancing the company in the process.

"Our company is unique in that it has many, many experts who make decisions about their work and take responsibility for the company as a whole," says Marcelo. "The antithesis of Cray Research is an organization in which all employees wait to be told what to do or for permission to do it."

Success is a team effort

Cray Research's culture is based on teamwork. Rarely is one hero singled out when the organization triumphs. Leaders such as Delores Brun realize the importance of the team framework and enjoy sharing success. Delores understands that it takes a lot of cooperation and the work of many employees to accomplish a large project, such as building a CRAY Y-MP machine. And she should know; she and 24 of her co-workers worked together to build 31 CRAY Y-MP machines.

"Leaders at Cray Research" has been approved by the Cray Management Committee (CMC) and is being distributed company-wide in this issue of *Interface*. All employees are encouraged to think about how this statement applies to them and their work, and how they can strive to be leaders within the company. Every employee, from a design engineer to a support person, a human resource representative to a manufacturing employee, can be a leader.

In every Cray Research location there are many leaders who make important decisions on company issues. These employees don't go unnoticed — their work styles greatly influenced the development of "Leaders at Cray Research." At Cray Research it is clear — the leader came first. The statement is the company's way of recognizing and promoting this critical element to its success. ●

Our company is unique in that it has many, many experts who make decisions about their work and take responsibility for the company as a whole.

educating themselves and expanding their expertise.

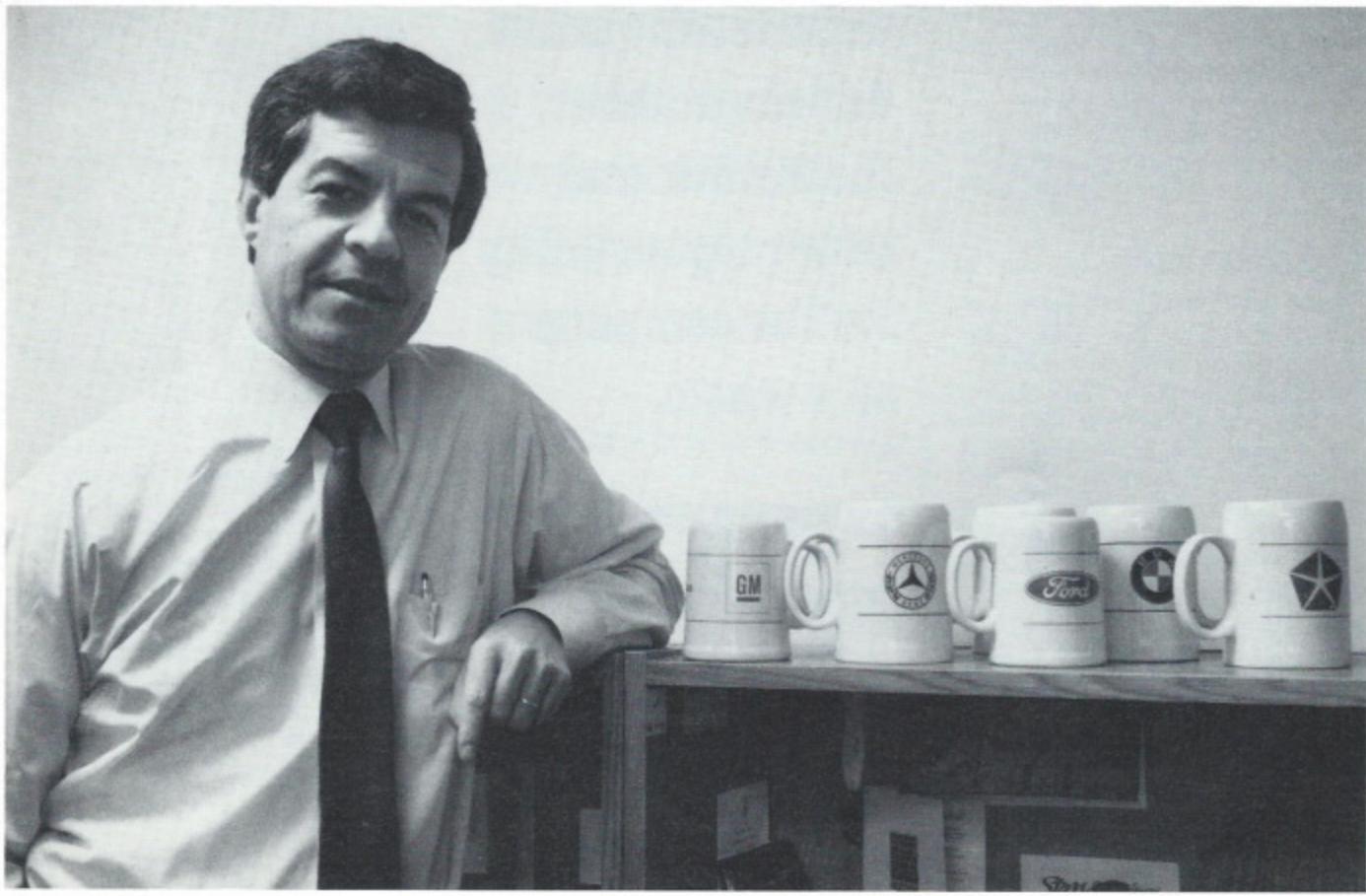
Leaders take responsibility for and make decisions about their work area, recognizing its impact on the company as a whole. They meet challenges with enthusiasm, and they push themselves to be the best

10.....

Cray Research delivers horsepower to the auto industry

It's time! Your car is on the fritz and costing you more money in maintenance than it's worth. In need of a new set of wheels, you head to the car dealership to investigate your options. Strolling among the rows of vehicles, you notice they all have something in common — a much sleeker, more aerodynamic, and somewhat space-aged look compared to your 1985 model. You're intrigued.

You take a test sit in one of the 1990 models. As the car door closes, an electric safety belt automatically crosses your shoulder and lap. The car's interior feels as though it was designed just for you — the seat matches the curve of your back, and every gadget, button, and control knob is in the perfect position. Your 1985 car, not yet considered "old," sits in the lot looking as though it has aged 15 years. In a way, it has.



Carlos Marino wants more mugs. As director of Industry, Science & Technology, Mendota Heights, he has led Cray Research's entrance into the automotive industry. With 19 sales to car companies throughout the world, Cray Research has no intention of putting on the brakes.

Cars built in the early- and mid-1980s spent from five to seven years in the design cycle. Meanwhile, the material, electronic, and manufacturing technologies of the car industry continued to advance. Your 1985 model was built on the basis of 1970s technologies.

Similarly, automobile designers today use 1990 technologies in their designs. When the first car rolls off the assembly line in about three years, it will possess a 1990 technology and look. Is there an end in sight to this pattern? Will a 1999 Buick look like a 1999 Buick? The answer, in great part, rides on Cray Research supercomputers.

Since 1985, Cray Research has provided the power and applications software to accelerate the automobile design cycle, the process through which auto manufacturers bring cars from conceptual design to the showroom. Now, car companies worldwide race to speed up the design cycle. And the power of a Cray Research system is a must for contenders in this race.

In Japan, car companies use their powerful Cray Research systems to reduce the design cycle from approximately 34 months to approximately 21 months. U.S. auto manufacturers work to reduce the same cycle from about 48 months to 24 months. This need for speed is one reason the automotive industry has been a growing market for Cray Research. The automotive industry ranks second, after the petroleum industry, in Cray Research's installed base in the commercial business sector.

"Cray Research has set the world standard for large-scale computer use in the auto industry," says Carlos Marino, director of the Industry, Science & Technology (IS&T) group, Mendota Heights. "We have 19 machines installed throughout almost all major car companies across the globe. This market is profitable because our machines are an integral part of the industry's productivity. We've experienced almost 100 percent annual growth in our install base since 1984."

Cray Research has attained over 85 percent of the market share in the automotive industry, and its systems have become important design tools for companies such as Bayerische Motoren Werke AG (BMW), Chrysler Motor Company, Continental AG, Mercedes Benz AG, Fiat Auto SPA, Ford Motor Company, General Motors Research, Honda Research and Development Company, LTD., La Manufacture Francaise Des Pneumatiques Michelin (Michelin), Mazda Motor Corporation, Mitsubishi Motor Company, Nissan Motor Company, Adam Opel AG, Peugeot SA, Toyota Motor Company, and Volkswagen AG.

But the company isn't putting on the brakes at 19 sales. With prospective customers such as Volvo Car Company, Daihatsu, and Isuzu, and opportunity to sell second and third systems to the largest car companies, Cray Research plans to maintain its stronghold in the automotive market. The company's traditional competitors have sold only two systems to this market — Fujitsu sold a VP100 system to Toyota, and Nippon Electronic Corporation (NEC) sold an SX-1 machine to Mazda.

No dummy

In 1984, the first Cray Research system in the auto industry went to General Motors Research, where it was used only for research and development. But Carlos had a vision. He wanted to drive Cray Research further into the automotive market. To do this, Carlos knew Cray Research had to show potential customers that supercomputers could be used in design and production processes as well.

So he visited many car companies. He learned more about their design and production processes and looked for ways in which these companies could more effectively use a Cray Research system. He found the first real area of opportunity in crashworthiness testing, which is the analysis of how a car's structural components react in a crash situation.

The old method of crashworthiness testing was done with a combination of lab simulations and some computer simulations on VAX systems, with the use of PAM-CRASH, one of the leading codes for crash simulations. Using full-scale prototype cars and a dummy driver, designers recreated an actual accident to learn how the vehicle would respond to the impact of the crash and to study how to improve the safety design of many of the car's features, including the steering wheel and column, headrest of the seats, and safety belts.

If car designers could simulate the car crash tests on a Cray Research system, they wouldn't have to spend the time and money producing the many car prototypes necessary for crashworthiness tests. And the money saved could be spent on research and development efforts to make cars as safe, fuel-efficient, and easy-to-drive as possible.

Crash project

Armed with this knowledge, Carlos and members of the engineering group of IS&T immediately started the "Crash Project." The goal: optimize the use of the PAM-CRASH code on Cray Research systems and show the auto manufacturing world how much time and money it could save by using the code.

"In essence, the Crash Project was a marketing effort with a lot of technological force behind it," says Greg Clifford, manager of the engineering applications group, Mendota Heights. "We knew if we could get this important code to work, and work fast, we could sell a system to every car company in the world because the benefits would be so great."

Two car companies, Peugeot and Volkswagen, took part in the Crash Project. Within a few months, the Crash Project team had PAM-CRASH working on the system at a rate of 100 megaflops — 400 times faster

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Greg Clifford, analyst manager, Mendota Heights, Tom Hewitt, senior programmer analyst, Chippewa Falls, and John Bauer, senior programmer analyst, Mendota Heights, race to increase Cray Research's market share in the automotive industry — an industry in which users continue to demand more power.

than the code ran on a VAX system! This performance set the standard for computational automotive crash analysis.

Rev up the power

Today, the complexity of the problems designers want to solve fuels the need for more power in the industry. Where once designers used

crash simulation to test the impact of the crash on the major structural components of the car, they now want to expand the number of variables in the calculation to include the effect of the impact on the driver, the air bag, an adult passenger, and an infant passenger. And they're going beyond studies of frontal impact, using their systems for side impact as well — all while they save millions of dollars each year.

Many car companies actually buy additional systems and use one system specifically for crash simulations. For example, Nissan of Japan uses its CRAY X-MP/12 system exclusively for crashworthiness testing and its new CRAY X-MP/432 system for other design and production computing.

"We now are in our second wind of sales because companies are requiring more power," says Carlos. "A few years ago, crash simulation problems

were simpler, only taking about four hours of central processing unit (CPU) time on a CRAY X-MP system. Today companies like Ford routinely run 20 CPU-hour jobs on their new CRAY Y-MP systems."

Target for imitation

Supercomputer-aided design and production assists car companies in reducing the design cycle. In addition, supercomputer use in this industry helps make cars more safe and fuel-efficient, and easier to drive.

Cray Research has optimized many codes important to car designers. Design and production applications such as structural analysis, computational fluid dynamics (CFD), driving dynamics and handling, injection molding, solid modeling, and heat transfer analysis now are being performed with Cray Research supercomputers. Designers use their systems for nearly every aspect of the car, including tires, aerodynamics, materials design, acoustics in the internal car compartment, and engine combustion and exhaust flow.

With its major developments in applications software for the auto industry, Cray Research has become a target for imitation by competitors. Current auto applications available on the CRAY Y-MP system have kept Cray Research two years ahead of its competitors, but the company cannot become idle.

New applications

Future success in developing new auto applications essentially is based on Cray Research's ability to commercialize technological leadership in auto, aerospace, and environmental applications, as the technology of one area often applies to another. For example, CFD technology is useful

in automobile and airplane design. Cray Research's work to optimize performance, reliability, documentation, and graphics in CFD will benefit marketing efforts in both the automotive and aerospace markets. This application provides designers with the tool that allows them to simulate gas and liquid flow. Auto designers use the application to design the shape of a car.

A new and useful application, based on CFD, is internal combustion design. It allows designers to simulate combustion in the car's engine, resulting in cars that are higher performing, more fuel-efficient, and less polluting. Cray Research will work with a consortia of customers to further develop and optimize the use of combustion codes.

"If all goes well in the development of this new application, it should spark more sales for Cray Research within the next two to three years," says Carlos. "There are high paybacks for car companies that use the combustion application, but the application is very computer-intensive. It requires a lot of power and, most likely, the purchase of additional machines."

Design optimization also is a key element in pushing car design forward. Cray Research recently released the code ASTROS, developed by the U.S. Air Force, for use in the auto industry as well as the aerospace and defense industries. This code allows car designers to investigate numerous material options for a car's composition.

Car companies also are becoming more concerned with the impact of car emissions, especially as the Environmental Protection Agency (EPA) passes more strict regulations. A car company that is not alert to EPA regulations today may experience costly repercussions tomorrow. For example, if a car in its final stages of production cannot conform to EPA emission-control standards, the car company could lose millions of dollars

as a result of product recall or delayed introduction of the model. For this reason, car companies increasingly use their Cray Research systems to conduct environmental impact studies.

Ties with design and production a must

The race to reduce design cycle time, combined with the desire to produce safe, fuel-efficient, and easier-to-drive cars, makes Cray Research supercomputers essential for companies wishing to compete in the auto industry. Cray Research systems have become indispensable tools in the car design and production processes.

Cray Research's continued success depends on its keeping abreast of new developments within the auto industry and searching for new application areas. Although Cray Research has sold initial systems to nearly every car company large and profitable enough to afford a supercomputer, the automotive market still is lucrative. As new applications are developed, each car company will require more power.

"The auto industry is one of the most fast-paced commercial industries, and the supercomputer upgrade cycle is equally fast," says Carlos. "This industry is one of the only industries in which each company will require more than one supercomputer. With this additional power, who knows what automobile designers will use their systems for — reducing the design cycle to a month or less, or even developing a whole new concept in personal transportation? Maybe one day cars won't have four wheels — maybe they'll hover atop the roadway. Whatever happens in the industry, Cray Research will be there providing the computing power to advance automotive technology." ■



From her temporary office in Linköping, Sweden, Pat Troolin, senior technical writer, Mendota Heights, conducts human factors research on Cray Research software products. By providing valuable information to her co-workers in Mendota Heights, Pat helps make the power of a Cray Research machine more accessible.

Power made easy

Sometimes computer software can be anything but soft on the computer user. Software documentation, for example, can be difficult to decipher. Menu commands can be baffling, and the error messages downright offensive. As these subtle, or not-so-subtle, elements disturb the interface between the human operator and the machine, computer users may feel the power of the tool is not very accessible after all. That power, then, may be wasted.

Not if Cray Research can help it. Cray Research is making strides in

applying human factors research data in the design of its software products, with the expectation that this will help make the computer easier and more comfortable to operate. Pat Troolin, senior technical writer from the software publications group in Mendota Heights, is one leader in this area.

Software elements such as the command key that allows a document to print, the color of the computer video screen, or the word order of a sentence in software documentation are important to Pat. Knowing that ultimately people must work with and understand computers, and that

software provides the user interface with the computer, Pat believes in the importance of software designed for the human user.

The best total performance

"The total performance of a Cray Research system is based on the combination of the speed of the system itself and the performance of the user," says Pat, who is in her sixth month of a year-long study leave at the National Defence Research Establishment (FOA) in Linköping, Sweden. At FOA, Pat conducts human factors research, studies that focus on the characteristics that affect the way users interact with software.

From her research, Pat supplies valuable information to Cray Research software documentation writers and software developers, providing a scientific basis for improvements to the company's products — improvements that can increase user performance and thus the total performance of the systems.

Time and time again, John Rollwagen, chairman and chief executive officer, has said that Cray Research must place the power of its systems into the hands of every researcher and scientist in the world. While that power, along with speed and the ability to solve complex problems, exists today, these characteristics no longer are enough. Cray Research's future products must take into account ease of use and accessibility to the machine's power.

Pat is one member of Cray Research who will help make the company's products more useable.

Working for FOA, Cray Research

At FOA, Pat works with a group of psychologists and computer scientists to learn more about the human factors of computer-related issues. FOA is an organization funded by the Swedish government to carry out national defense research for

Sweden. It is the largest interdisciplinary research facility in Scandinavia. Because Sweden is a neutral country, its defense research is based on non-offensive military and weapons research. Researchers at FOA also investigate ways to improve civilian life. Areas of applied research include information technology; weapons technology; protection against biological, chemical, and nuclear weapons; and survival. Basic research areas include mathematics, computer science, chemistry, medicine, physics, sociology, and behavioral science.

FOA 53, the research group with which Pat works, aims at answering particular questions concerning human interaction with computer software. For example, it is well known that people naturally learn by exploration, but for some reason this is inhibited when humans interact with computers. Why? To what extent is the computer system's response to human errors responsible? As FOA researchers investigate these questions, they can test theories on Cray Research software products, including menus for DOCVIEW, an on-line documentation program; UNICOS error messages and guidelines; and UNICOS manual pages (man-pages). The resulting information can be used to formulate concrete suggestions for making Cray Research software products more user-friendly.

First project

The first joint FOA-Cray Research project is a usability test of UNICOS man-pages, the documentation system for UNICOS. This on-line and hard copy documentation is known for being inconsistent and too technical for the audience it serves; members of Cray Research's software publications group already have rewritten a number of the man-pages. Pat's test will focus on the original and rewritten versions and will involve 30 human subjects.

To test the usability of the man-pages, the subjects — engineers and

scientists representative of Cray Research customers (some were recruited from the company's European sites) — will be asked to perform tasks on a computer that require the use of the man-pages. Both objective testing and a questionnaire will be used to pinpoint improvements for text quality, as opposed to the way the screen looks or how the text is accessed. John Madsen, a technical writer in the software publications group, will conduct a similar, smaller-scale test in Mendota Heights, adding to the scientific data upon which guidelines for rewriting man-pages will be developed.

Pat has other projects planned for 1990. She will work on a project with Dr. Hans Marmolin, technical director of FOA 53 and the chairperson of the working group on menu-system design within the International Standards Organization (ISO), the body that governs the development of international standards and guidelines for the computer industry. This project will focus on the development of an on-line tool to help software designers implement ISO menu guidelines.

Pat also will be involved in color perception research and the production of a color-selection menu system that conforms to the ISO menu guidelines. This menu system, called Palette, is an aid for selecting colors for video images. It will be presented at a conference in the United States in February.

At the end of the year, Pat will focus on error messages. Her studies will address attitudes conveyed by error messages and how these attitudes affect user performance. The studies will involve evaluating user satisfaction with error messages written according to the new Cray Research error messages guidelines, which Pat helped write before leaving for Sweden.

Details, details, details

What has Pat learned so far? That seemingly small details — the color of a computer video screen, the

word order of a sentence in software documentation, the tone of an error message — can have an impact on usability and total performance of the system. Often thought of as trivial features, they can cause confusion and fatigue without the user even realizing it.

Such subtleties as the key stroke required to trigger a command on a menu screen can have a dramatic effect on user performance. Human factors research proves that some menu formats are better than others. For example, the best way to set up menu commands is to use the first letter of the command as the key stroke that triggers that command; the user strikes the "d" key for delete, "p" for print, and "s" for select. But when two commands start with the same letter, such as "select" and "search," this same menu setup will not work. The second best arrangement is to use numbers to trigger the command, such as 1 for delete, 2 for print, 3 for select, and 4 for search. The least preferred and most confusing setup for the user is the use of letters that have no association with the command: "a" for delete, "b" for print, and so on.

"It's important that Cray Research designers be aware of this type of information as they set up menu screens and commands for our software," says Pat. "If subtleties are ignored, user performance can be hampered greatly. And we don't want to puzzle our users. We want to provide straightforward, easy-to-use systems."

The idea of user-friendly software is essential from a marketing perspective. If a next step for Cray Research is to place the power of its systems into the hands of every scientist and researcher in the world, it makes sense that the power should be easily grasped and comfortable to use. There's no doubt that Cray Research provides the most powerful supercomputers available. With human factors research and application, Cray Research now is making that power easier to access. ●

INTERACT

strengthens communication commitment

What will John Rollwagen, Marcelo Gumiucio, John Carlson, Ed Masi, Bob Ewald, Les Davis, and Deborah Barber each do for approximately 90 minutes each quarter throughout 1990? And why will about 960 employees join them? Together, they will INTERACT!

INTERACT is a new focus group program designed to promote small-group communication between company executives and employees. In an INTERACT meeting, an executive will meet with approximately 15 to 20 individuals to informally discuss issues of importance to employees. Employees can share their perceptions of and concerns about what's happening at Cray Research, and members of management will share information about changes made and directions taken, as well as their perspectives of current challenges and areas of opportunity for the company.

INTERACT also will generate valuable ideas, as it provides a forum for employees to voice their thoughts directly to a member of upper management. Through INTERACT, the company will maintain an open two-way communication channel, allowing feedback on ideas, suggestions, questions, and concerns regarding Cray Research employees everywhere. Notes will be taken at each meeting, and the information will be compiled into

summaries that will be distributed to local leaders throughout the company on a regular basis.

Everybody INTERACT!

The success of this new program requires the participation and involvement of as many Cray Research employees as possible. While it is not feasible to hold 250 INTERACT meetings in a year and involve all 5,000-plus company employees directly, approximately 47 meetings will be held, involving nearly 20 percent of the total employee population.

Still, every single employee can get involved in the program. Indeed, employees who don't attend an INTERACT meeting are just as important to the success of the program as the employees who do attend. All employees can find out who the INTERACT attendees are in their location from their local human resource representative, who will have quarterly schedules of all INTERACT meetings. Prior to a meeting, employees are asked to share their ideas with an INTERACT representative. This will allow a greater number of employees to "talk" with upper management. And after the meeting, INTERACT representatives are encouraged to talk with co-workers and share what they learned.

INTERACT participants will be selected randomly by local human resource representatives. Employees with a particular interest in attending a meeting should contact their local human resource representative.

INTERACT kickoff

INTERACT began in January and February with meetings in Chippewa

Falls, Mendota Heights, and Minneapolis. During 1990, an average of three INTERACT meetings will be held each month, at various Cray Research locations throughout the world.

Whether employees have questions on issues unique to their locations or pertaining to the company as a whole, or suggestions to improve a company procedure or system, an INTERACT meeting will be an excellent vehicle for employees to share their ideas.

"As the company grows and changes, we recognize the importance of effective and regular communication with employees," says John Rollwagen, chairman and chief executive officer and a participant in the program. "I am enthusiastic about the opportunity to meet with groups from around the company. With employee input on a variety of issues, I and other members of upper management will become more successful at steering the company."

INTERACT is one way Cray Research is rising to the challenge of preserving and improving communication. A valuable communication program, INTERACT will grow and adapt to both the changing and growing company in which we work and the changing and growing industry in which we maintain our leadership. ●

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